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Approximate Ephemeris of the Leonids, from 1897 *December* 24 *to* 1898 *April* 8.

(*Communicated by G. Johnstone Stoney, D.Sc., F.R.S.*)

The following ephemeris of the part of the swarm of the *Leonids* which passed close to the Earth in 1866 is a continuation of the ephemeris in the *Monthly Notices* for 1896 December, and is intended to prepare for another attempt to photograph the meteors in the open sky. There was no perceptible impression on the photographic plate in the trial made by Dr. Isaac Roberts last spring; but it has been thought desirable to repeat the observation, since the conditions will be somewhat more favourable in the coming season, owing to the increasing intensity of sunshine upon the meteors, which will make the brightness of the image of the stream upon the photographic plate about three times what it was last season.

It was from the first recognised that it falls short of being probable that even a great depth of bodies so small and so scattered will sufficiently impress the most delicate photographic plates we possess. But inasmuch as what is aimed at is not actually impossible, and as the gain to astronomy will be great if it is attained, it has been thought desirable to make preparation for another attack.

The ephemeris has been drawn up under the kind direction of Dr. Downing, Superintendent of the Nautical Almanac, and the computations have been made by Mr. Thomas Wright, of the National Almanac Office. The cost has been defrayed out of a grant made by the Royal Society.

Greenwich midnight.		Right Ascension.			Decl.		Log. of Dist. from Earth.
1897.		h	m	s	°	′	
Dec.	24	14	10	54	S. 5	29	0·8995
	25	14	11	6	5	29	0·8983
	26	14	11	17	5	28	0·8970
	27	14	11	28	5	28	0·8958
	28	14	11	38	5	27	0·8946
	29	14	11	48	5	27	0·8933
	30	14	11	58	5	27	0·8921
	31	14	12	7	5	26	0·8908
1898.							
Jan.	1	14	12	16	5	25	0·8895
	2	14	12	25	5	25	0·8882
	3	14	12	33	5	24	0·8869
	4	14	12	40	5	23	0·8856
	5	14	12	47	5	23	0·8843
	6	14	12	53	5	22	0·8830
1898.		h	m	s	°	′	
Jan.	7	14	12	59	S. 5	21	0·8817
	8	14	13	5	5	20	0·8803
	9	14	13	10	5	19	0·8790
	10	14	13	15	5	18	0·8776
	11	14	13	19	5	17	0·8762
	12	14	13	23	5	15	0·8749
	13	14	13	26	5	14	0·8735
	14	14	13	29	5	13	0·8721
	15	14	13	31	5	12	0·8707
	16	14	13	33	5	10	0·8693
	17	14	13	34	5	9	0·8679
	18	14	13	35	5	7	0·8664
	19	14	13	35	5	5	0·8650
	20	14	13	34	5	4	0·8635
	21	14	13	33	5	2	0·8621

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Greenwich, midnight.	Right Ascension.			Decl.		Log. of Dist. from Earth.	Greenwich, midnight.	Right Ascension.			Decl.		Log. of Dist. from Earth.
1898.	h	m	s	°	′		1898.	h	m	s	°	′	
Jan. 22	14	13	32	S. 5	0	0·8607	Mar. 2	14	4	41	S. 3	3	0·8042
23	14	13	30	4	58	0·8593	3	14	4	14	2	59	0·8029
24	14	13	28	4	57	0·8578	4	14	3	47	2	55	0·8016
25	14	13	25	4	55	0·8564	5	14	3	19	2	50	0·8003
26	14	13	21	4	53	0·8549	6	14	2	50	2	46	0·7990
27	14	13	17	4	50	0·8535	7	14	2	21	2	42	0·7977
28	14	13	12	4	48	0·8520	8	14	1	52	2	37	0·7964
29	14	13	6	4	46	0·8505	9	14	1	22	2	33	0·7951
30	14	13	0	4	44	0·8490	10	14	0	51	2	28	0·7939
31	14	12	54	4	41	0·8476	11	14	0	20	2	24	0·7926
Feb. 1	14	12	47	4	39	0·8461	12	13	59	48	2	19	0·7914
2	14	12	39	4	37	0·8446	13	13	59	16	2	15	0·7902
3	14	12	30	4	34	0·8431	14	13	58	43	2	10	0·7890
4	14	12	21	4	31	0·8417	15	13	58	9	2	5	0·7879
5	14	12	11	4	29	0·8402	16	13	57	35	2	1	0·7867
6	14	12	1	4	26	0·8387	17	13	57	0	1	56	0·7856
7	14	11	50	4	23	0·8372	18	13	56	24	1	51	0·7845
8	14	11	38	4	21	0·8357	19	13	55	48	1	46	0·7834
9	14	11	26	4	18	0·8342	20	13	55	13	1	41	0·7823
10	14	11	13	4	15	0·8328	21	13	54	37	1	36	0·7813
11	14	11	0	4	12	0·8313	22	13	54	0	1	32	0·7802
12	14	10	47	4	9	0·8298	23	13	53	22	1	27	0·7792
13	14	10	32	4	6	0·8284	24	13	52	43	1	22	0·7782
14	14	10	16	4	2	0·8269	25	13	52	5	1	17	0·7773
15	14	10	0	3	59	0·8254	26	13	51	26	1	12	0·7763
16	14	9	43	3	56	0·8240	27	13	50	47	1	7	0·7754
17	14	9	26	3	52	0·8225	28	13	50	7	1	1	0·7745
18	14	9	8	3	49	0·8211	29	13	49	26	0	56	0·7736
19	14	8	49	3	45	0·8196	30	13	48	45	0	51	0·7727
20	14	8	30	3	42	0·8182	31	13	48	4	0	46	0·7719
21	14	8	10	3	38	0·8167	Apr. 1	13	47	23	0	41	0·7711
22	14	7	49	3	35	0·8153	2	13	46	41	0	36	0·7703
23	14	7	28	3	31	0·8139	3	13	45	59	0	31	0·7695
24	14	7	6	3	27	0·8125	4	13	45	17	0	26	0·7688
25	14	6	43	3	23	0·8111	5	13	44	34	0	21	0·7681
26	14	6	20	3	19	0·8097	6	13	43	51	0	16	0·7674
27	14	5	56	3	15	0·8083	7	13	43	8	0	10	0·7667
28	14	5	31	3	11	0·8070	8	13	42	25	0	5	0·7661
Mar. 1	14	5	6	3	7	0·8056							

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A Spectroscopic Method for Determining the Second and Third Contacts during a Total Eclipse of the Sun. By William Shackleton, A.R.C.Sc.

The spectroscopic method by which the determination of all the contacts can be made, as given by Faye and Young in 1869, although capable of giving very accurate results, requires at the same time a moderately powerful spectroscope attached to a telescope, and also a great nicety of adjustment.

For many purposes at the actual time of eclipse the second and third contacts are more important than the others, so for the benefit of eclipse observers I give the following method by which these can be determined, being the one I employed during the total eclipse of 1896 August 9 in Novaya Zemlya, requiring no larger size of instrument than can be put into one's waistcoat pocket.

If at any time the Sun be looked at through a prism, a band of continuous spectrum will be seen, but in a total eclipse of the Sun, as the Moon advances, the Sun's disc will be gradually obscured until there is only a thin crescent left; if now this crescent be examined by means of the prism with the refracting edge parallel to the line joining the horns of the crescent, it will be seen that a slit is unnecessary, for eventually the remaining portion of the Sun's photosphere becomes so thin that the Fraunhofer groups make their appearance as curved lines. (This can be seen at any time by looking at the Moon with the same apparatus when a very thin crescent.)

A very convenient form of instrument to use is a small direct vision prism; the one I employed was an ordinary Maclean eyepiece or star spectroscope (kindly lent me by General A. de Gorloff), with the cylindrical lens removed. With such a small instrument the whole of the rapidly thinning crescent can be observed at once, and at length the continuous band of spectrum begins to get narrower, and bright arcs representing the spectrum of the chromosphere, corresponding in position to H_α, D_3, H_β, and H_γ, appear protruding at either side. It is now necessary to be on the alert, for these bright arcs grow rapidly in brightness and length, while the continuous band which they can be seen to cross grows correspondingly narrower with the waning photosphere, until at last with great rapidity it thins out to nothing, which moment of disappearance marks the time of second contact.

For the determination of the third contact it is necessary to observe the reverse phenomenon, *i.e.* the appearance of the continuous spectrum, crossing at right angles and in the middle of